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Boroel et al.

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(54) **PROTECTION SHIELD FOR VEHICLE HEADLINER**

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B60R 21/231	(2011.01)
B60R 21/232	(2011.01)

(52) **U.S. Cl.**

CPC ***B60R 13/0212*** (2013.01); ***B60R 21/232*** (2013.01); ***B60R 21/23138*** (2013.01); *B60R 2013/0287* (2013.01)

(58) **Field of Classification Search**

CPC B60R 13/0212; B60R 21/232; B60R 21/23138; B60R 2013/0287; B60R 21/214; B60H 1/3421; B60H 2001/3471

See application file for complete search history.

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(57) **ABSTRACT**

Airbag protection shields are disclosed that comprise an inner surface and an outer surface, wherein the shield is configured to attach to a vehicle headliner assembly and cover a portion of at least one vehicle component in the headliner assembly, the at least one vehicle component being positioned such that a nearby airbag may contact the at least one vehicle component upon deployment. The protection shields may be configured to protect a headliner assembling containing air ducts and air vents.

11 Claims, 3 Drawing Sheets

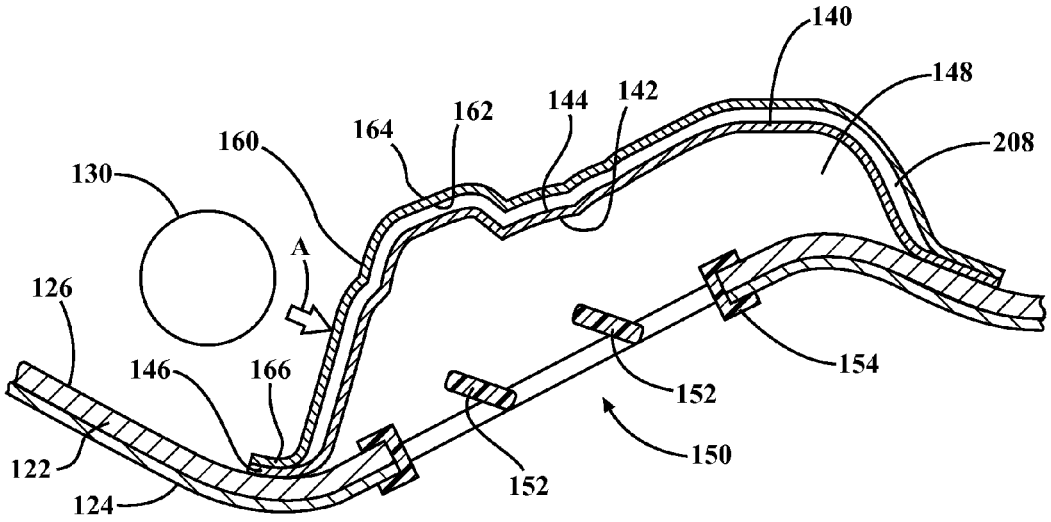
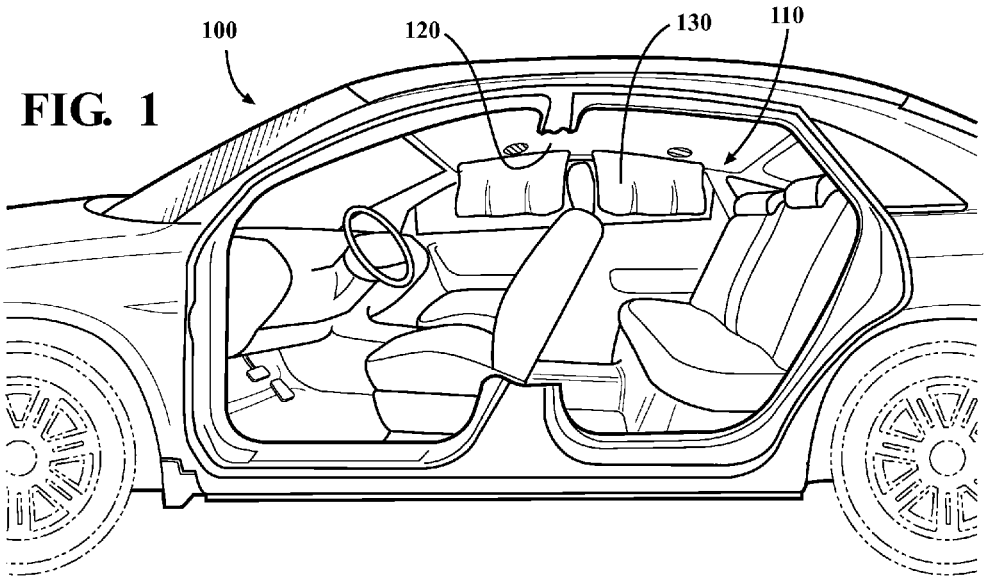


FIG. 1



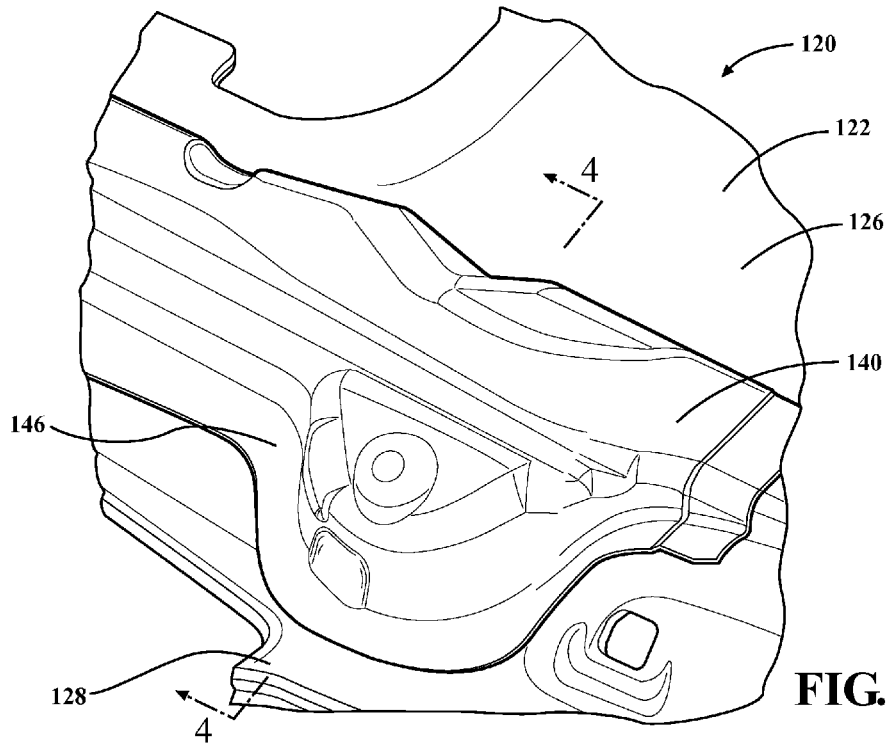


FIG. 2

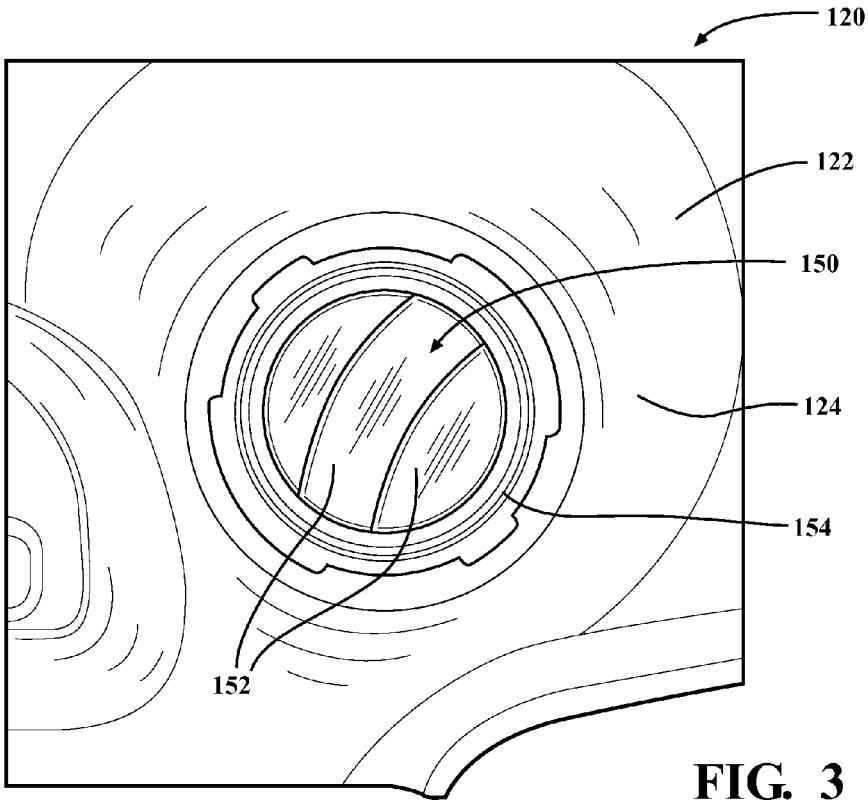
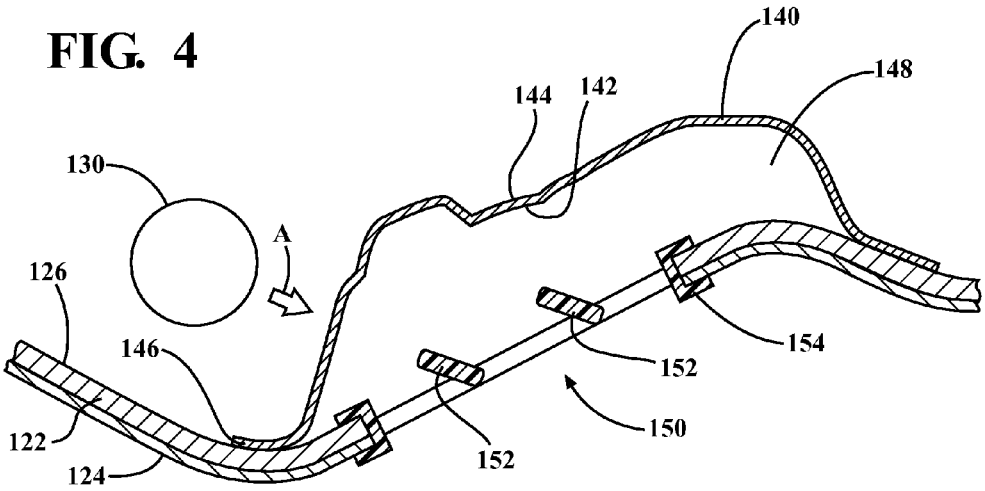

120
122
150
124
154
152

FIG. 3

FIG. 4


140
148
144
142
130
A
126
146
154
152
150
122
124
152

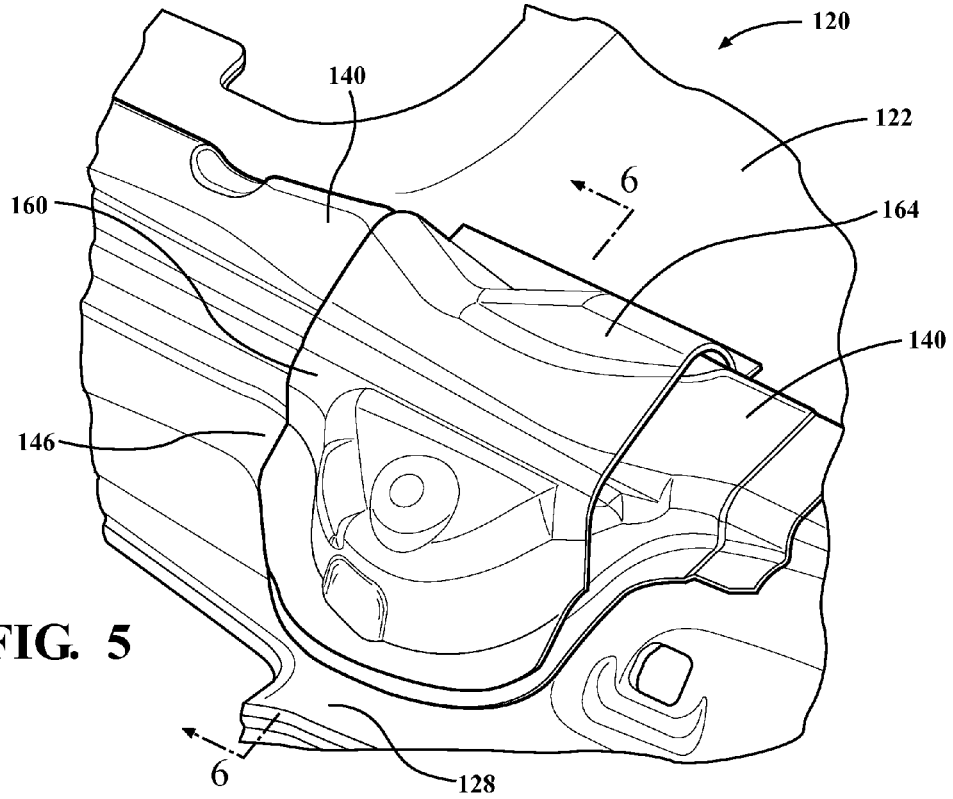
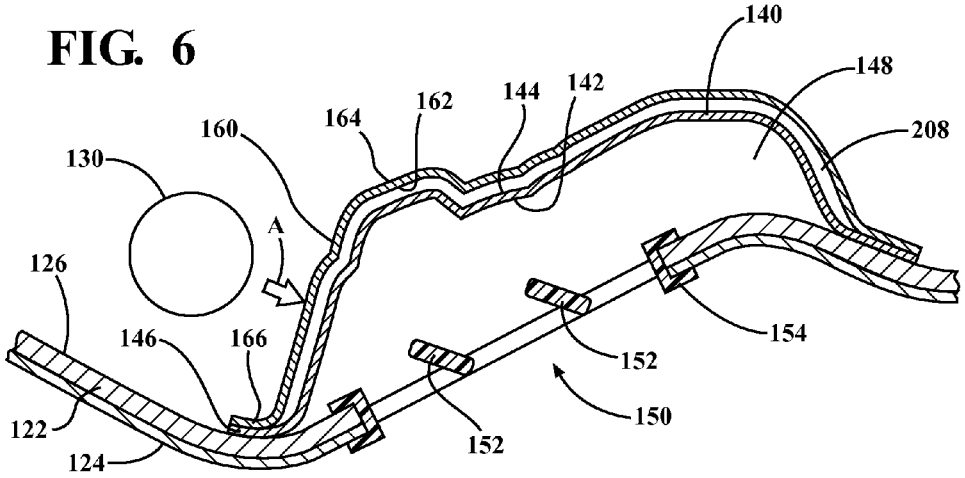

120
140
122
6
160
164
140
146
6
128

FIG. 5

FIG. 6


140
148
208
162
144
142
164
160
130
A
126
146
166
154
152
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122
124
152

PROTECTION SHIELD FOR VEHICLE HEADLINER

BACKGROUND OF THE DISCLOSURE

The present disclosure relates generally to protective shields for use in vehicles and, more particularly, to protective shields for vehicle headliners near side curtain airbags.

Airbag modules have become common in modern vehicles. An airbag module typically includes an inflatable airbag and an inflator. Side curtain airbags may be incorporated in the sides of the interior of vehicles and may deploy from an area near the headliner of a vehicle. In response to an activation event, a sensor activates the inflator to generate an inflation gas that rapidly inflates the inflatable airbag to facilitate protection of an occupant. Headliners routinely include sensitive components that may be damaged or come apart if impacted during an airbag deployment.

SUMMARY OF THE DISCLOSURE

Embodiments of shields for protecting vehicle components near airbags are described herein. Protective shields may be incorporated into a headliner assembly of a vehicle and may be configured to cover vehicle components such as air ducts and vents. The protective shield may prevent airbag deployment forces from damaging vehicle components or causing parts of the components to be projected into the interior of the vehicle.

In one implementation, a vehicle headliner assembly comprises a headliner having a first side and a second side, an air duct having an inner duct surface and outer duct surface, wherein a portion of the inner duct surface is attached to the second side of the headliner creating a cavity between in the inner duct surface and headliner, and a protection shield having an inner surface and outer surface, wherein a portion of the inner surface is attached in abutment to the outer duct surface of the air duct.

In another implementation, a vehicle headliner assembly comprises a headliner having a first side and a second side, at least one air duct having an inner duct surface and outer duct surface, wherein a portion of the inner duct surface is attached to the second side of the headliner creating a cavity between the inner duct surface and headliner, and a protection shield having an inner surface and outer surface, wherein a portion of the inner surface is attached in abutment to the outer duct surface of the air duct and the inner surface of the protection shield is formed in substantially the same shape as the outer duct surface; and a side curtain airbag disposed proximate to the protection shield.

In yet another implementation, an airbag protection shield comprises an inner surface and an outer surface, wherein the shield is configured to attach to a vehicle headliner assembly such that the shield is positioned between a portion of at least one vehicle component in the headliner assembly and an airbag assembly while in an attached position.

The foregoing features and elements may be combined in various combinations without exclusivity unless expressly indicated otherwise. These features and elements as well as the operation thereof will become more apparent in light of the following description and the accompanying drawings. It should be appreciated, however, that the following description and drawings are intended to be exemplary in natures and non-limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

The description makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views, and wherein:

FIG. **1** shows a partial perspective view of a vehicle interior with a side curtain airbag in a deployed condition;

FIG. **2** shows a perspective view of a portion of an outer side of a headliner assembly;

FIG. **3** shows a perspective view of a vent located in the headliner assembly of FIG. **2**;

FIG. **4** shows a cross sectional view of the headliner assembly of FIG. **2** along view **4-4** with a side curtain airbag in a folded condition;

FIG. **5** shows a perspective view of a portion of an outer side of a headliner assembly with added protection shield; and

FIG. **6** shows a cross sectional view of the headliner assembly of FIG. **5** along view **6-6** with a side curtain airbag in a folded condition.

DETAILED DESCRIPTION

Protective shields are described herein that may protect sensitive vehicle components from forces upon airbag deployment. Protective shields may be included in headliner assemblies that cover components and redirect airbag deployment forces. While it is contemplated that such shields may be utilized to protect a variety of sensitive vehicle components, the disclosure may be described with respect to embodiments protecting air ducts and air vents within headliner assemblies. The protective shields may be attached directly to a headliner or vehicle component and may prevent damage to the components.

FIG. **1** shows a perspective view of a partial vehicle **100** with interior **110**, headliner assembly **120**, and side curtain airbags **130**. Headliner assembly **120** may be installed near the top of the interior **110** above potential occupants in vehicle **100**. Headliner assembly **120** may span the entirety or any portion of the interior **110** above occupants. Vehicle **100** may also include side curtain airbags **130** to protect occupants in the event of a crash or rollover. Vehicle **100** is shown to be a sedan automobile, but vehicle **100** may be any vehicle configured to transport passengers.

In some embodiments, headliner assembly **120** may include headliner **122**. Referring to FIGS. **2** and **4**, headliner **122** may include inner surface **124** and outer surface **126**. Inner surface **124** may be the surface that faces towards occupants in the interior **110** of vehicle **100**. Outer surface **126** may oppose inner surface **124** and face the roof of vehicle **100** when the headliner is installed. Headliner **122** may comprise one sheet of material or may include distinct layers of differing properties. For example, headliner **122** may include a semi-rigid backing material of plastic, polymers, and/or fibrous material that includes outside surface **126**. Headliner **122** may include a layer of decorative material that includes inner surface **124**. Outer surface **126** may be configured to include mounting structure to allow for headliner **122** to be attached to vehicle **100** or additional vehicle components.

With continued reference to FIG. **1**, airbags **130** may be configured to inflate to a deployed condition wherein airbags **130** may extend downward near the sides of vehicle **100**. Deployed airbags **130** may cushion impact of occupants against the side portion of vehicle **100**. Airbags **130** may be stored in a deflated condition (see FIGS. **4** and **6**) and may be inflated to a deployed condition shown in FIG. **1**. Upon an activation event, vehicle sensors may signal airbag inflators to rapidly inflate airbags **130**. For example, airbags **130** may be deployed during activation events such as a vehicle crash. Airbags **130** may be attached to headliner assembly **120** or portions of the vehicle **100** near a side edge **128** of headliner assembly **120**. Due to rapid inflation, airbag **130** may impact

and exert forces on surrounding vehicle components. In some embodiments, airbags **130** may be configured to impact and partially detach headliner **122** from vehicle **100** to deploy between headliner **122** and other portions of vehicle **100**. Airbags **130** may also be configured to push through and tear headliner **122**.

In some embodiments, headliner assembly **120** may include a variety of vehicle components. Some vehicle components may include, for example, heating and cooling systems, electronics and wiring components, lights, and other safety components. In the exemplary embodiments of FIGS. **2** and **4**, headliner assembly **120** may include air duct **140** to facilitate the movement of air throughout interior **110** of vehicle **100**. Duct **140** may include an inner duct surface **142** and an outer duct surface **144**. Duct **140** may be configured to attach to headliner **122** to create a duct cavity **148** between inner duct surface **142** and headliner **122**. Duct **140** may include duct flange **146** that is attached to outer surface **126** of headliner **122**. In some embodiments, duct **140** may be made out of a lightweight material to reduce cost and weight to vehicle **100**. For example, duct **140** may be comprised of thin sheet metal that may deform under substantial force.

FIG. **3** shows a perspective view of a portion of headliner assembly **120** with a vent **150**. In some embodiments, vent **150** may be an aperture defined in headliner **122**. As shown in FIGS. **3** and **4**, vent **150** may include a plurality of vanes **152** and a vent attachment **154**. Vent attachment **154** may include a channel that captures headliner **122** when vent **150** is installed in headliner assembly **120**. Components of vent **150** may be made from a variety of materials such as polymer and metal. In addition to duct **140** and vent **150**, headliner assembly **120** may include or be installed proximate to a variety of sensitive components such as electronics, safety features, and lights.

FIG. **4** shows a cross sectional view of the headliner assembly **120** along view **4-4** with a side curtain airbag **130** in a folded condition. Airbag **130** is shown folded in a rounded cross section in FIG. **4**, but it is contemplated that several folding patterns may be utilized. Due to the configuration of headliner assembly **120**, the airbag **130** may be located near sensitive vehicle components such as duct **140** and vent **150**. Upon an activation event, airbag **130** may be rapidly inflated and the inflation of airbag **130** may cause airbag **130** to expand in a radial direction from the center of airbag **130**. This may result in a deployment force applied to headliner **122** or any component nearby such as duct **140**. For example, force A as shown in FIG. **4** may be applied to duct **140**. Force A, in some situations, may cause damage to duct **140** and vent **150**. For example, force A may cause duct **140** to substantially deform and impact vent **150** causing portions of vent **150** to be projected into interior **110** of vehicle **100**.

FIG. **5** depicts a portion of headliner assembly **120** with a protection shield **160**. In some embodiments, shield **160** may be attached to headliner **122** or components within headliner assembly **120** to protect certain areas from forces arising from airbag **130** deployment. For example, shield **160** may be disposed over a portion of duct **140** as shown in FIGS. **5** and **6**. Shield **160** may include inner shield surface **162** and outer shield surface **164**. Shield **160** may also include shield flange **166**.

In some embodiments, shield **160** may be shaped to cover a portion of a vehicle component. For example, shield **160** may be shaped to match the contours of duct **140** as shown in FIGS. **5** and **6**. Inner shield surface **162** may face and substantially match the shape of outer duct surface **144**. In some embodiments, inner shield surface **162** may be attached to outer duct surface **144**. For example, the inner shield surface **162** of shield flange **166** may be attached to the outer duct surface **144** of duct flange **146** to secure shield **160** to headliner assembly **120**. Thus, shield **160** may be attached such that a portion of the inner shield surface **162** abuts a portion of outer duct surface **144**. Shield **160** may be configured such that gap **208** may be created between the inner shield surface **162** and outer duct surface **144**. Gap **208** may allow for shield **160** to be attached to headliner assembly **120** with slight variations in duct **140** dimensions. In other embodiments, shield flange **166** may be attached directly to headliner **122**. Shield **160** may be attached to duct **140** or headliner **122** using a variety of methods, such as the application of adhesives or mechanical fasteners.

Shield **160** may generally have a uniform thickness as shown in FIG. **6**, or shield **160** may have portions with varying thicknesses. For example, the portion of shield **160** closest to airbag **130** may have greater thickness than other portions of shield **160** to increase the strength of shield **160** near airbag **130**.

Shield **160** may be configured to withstand airbag force A without substantially breaking or deforming. For example, shield **160** may transfer force A through shield **160** and into headliner **122** rather than allowing the force to cause duct **140** to deform or break. This may prevent or reduce damage to duct **140** and may prevent vent **150** from damaging or being displaced upon airbag **130** deployment. Airbag **130** may be deployed without deforming duct **140** and causing components of vent **150** such as vanes **152** from becoming projectiles within interior **110** of vehicle **100**. Shield **160** may also be configured to prevent damage to other sensitive components, such as electronics, safety features, and lights. In some embodiments, shield **160** may also provide the benefit of directing airbag **130** in a certain direction upon deployment such as through or around headliner **122**.

Shield **160** may be made out of a variety of natural and synthetic materials. For example, shield **160** may be constructed out of a polycarbonate thermoplastic polymer. Shield **160** may be configured to be substantially rigid where shield **160** may resist bending, flexing, or being forced out of a predetermined shape.

The foregoing description relates to what are presently considered to be the most practical embodiments. It is to be understood, however, that the disclosure is not to be limited to these embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law.

What is claimed is:

1. A vehicle headliner assembly, comprising:

a headliner having a first side and a second side;

an air duct having an inner duct surface and outer duct surface, wherein a portion of the inner duct surface is attached to the second side of the headliner defining an air duct cavity between in the inner duct surface and headliner;

a protection shield having an inner surface and outer surface, a portion of the inner surface of the protection shield is attached in abutment to a portion of the outer duct surface of the air duct; and

an airbag, the protection shield being positioned between the airbag and the air duct.

2. The headliner assembly of claim **1**, further comprising an air vent attached to an aperture in the headliner.

3. The headliner assembly of claim 2, wherein the air vent is located in a portion of the headliner vertically below the air duct and protection shield.

4. The headliner assembly of claim 1, wherein the airbag is a side curtain airbag positioned proximate to an outside edge of the headliner.

5. The headliner assembly of claim 1, wherein the protection shield is comprised of a polycarbonate polymer.

6. The headliner assembly of claim 1, wherein the inner surface of the shield matches substantially the same shape as the outer surface of the air duct.

7. The headliner assembly of claim 1, wherein the protection shield further comprises a shield flange located at a shield edge configured to attach in abutment to a portion of an outer surface of the air duct.

8. The headliner assembly of claim 7, further comprising a gap between the protection shield and air duct.

9. A vehicle headliner assembly, comprising:

a headliner having a first side and a second side;

at least one air duct having an inner duct surface and outer duct surface, wherein a portion of the inner duct surface is attached to the second side of the headliner defining an air duct cavity between the inner duct surface and headliner;

a protection shield having an inner surface and outer surface, wherein a portion of the inner surface of the protection shield is attached in abutment to the outer duct surface of the air duct and the inner surface of the protection shield is formed in substantially the same shape as the outer duct surface; and

a side curtain airbag, the protection shield being positioned between the airbag and the air duct cavity.

10. The headliner assembly of claim 9, wherein the protection shield further comprises a shield flange located at a shield edge configured to attach in abutment to a portion of an outer surface of the air duct.

11. The headliner assembly of claim 9, further comprising a gap between the protection shield and air duct.

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